Curiosity Guide #509
Electromagnetism

Accompanies Curious Crew, Season 5, Episode 9 (#509)

U-Shaped Electromagnet

Investigation #8

Description

Does the shape of a magnet affect its performance? Find out!

Materials

- U-shaped electromagnet:
- Paper clips
- 6-volt battery
- Alligator clips
- Nail coil electromagnet

Procedure

1) Examine the U-shaped electromagnet and compare it to the nail electromagnet.
2) Use the alligator clips to connect the U-shaped magnet to the 6-volt battery
3) How many paper clips can this magnet hold?
4) How much weight can the U-shaped magnet suspend?

My Results

Explanation

When electrons flow through a coiled wire, or **solenoid**, a magnetic field is created inside and around that loop. Increasing the number of coils of wire in the loop creates a stronger magnetic field. Wrapping the coil around an iron core, as in the case of the electromagnet, significantly increases the strength of the magnetic field when it is electrified. Did you notice that the U-shaped electromagnet has two solenoids? This makes the U-shaped magnet incredibly strong.

Before the electromagnet was connected to the battery, the hook plate did not attract the paper clips. The atoms in the iron solenoid core and metal plate behave like little electromagnets because the charged atoms are constantly repelling one another while spinning. However, when the solenoid is electrified, the atoms line up with one another, and the iron becomes a strong temporary magnet. This causes the iron plate to attract a lot of paperclips or suspend really heavy objects. Turning off the flow of electricity causes the solenoids to gradually lose their magnetic properties, and the iron atoms randomly change their spinning direction.

Investigate further! One of the greatest places to see an electromagnet at work is at a scrap yard where metal gets sorted and recycled. Although not all metal is magnetic, there are several that are, including iron, cobalt, and nickel. Iron is a very common metal that can easily be separated from other metals simply by using an electromagnet. These electromagnets are attached to cranes that can swing over a pile of metal, get lowered down, and attract the magnetic metals. Once the metals are lifted, the crane can swing its arm and move the pile of metals. The crane operator then turns off the electricity to the crane, and the pile of metals is dropped right where it needs to be. These electromagnets are so powerful they can even lift up a car! Wow!

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